TITLE

ASSEMBLY AND METHOD FOR AUTOMATICALLY UNROLLING AND CUTTING STRETCH FILM

DESCRIPTION

Field of the invention

The present invention relates to the field of equipment for packaging with stretch film. More precisely, it concerns a new assembly for unrolling and pre-stretching stretch film with an improved system for automatically cutting the film. The invention also relates to a new cutting procedure which is carried out with this assembly.

Description of the prior art

According to the known art, equipment - be it fixed or mobile - for packing goods/products with stretch film comprises an assembly for unrolling the film from a spool and for pre-stretching it. The assembly feeds the film towards the load to be wrapped, which is generally carried on a pallet. The spool is unrolled by means of rubber-covered rollers that are controlled by electromagnetic brakes or clutches or electronically operated motor reducers. The film passes over a series of idle conveyance rollers before it leaves the assembly and arrives at the load that is to be wrapped.

In case of a fixed installation, the load, arranged on an appropriate platform, rotates around its own axis. In case of mobile equipment, it is the unrolling and pre-stretching assembly that rotates around the load, which remains in a fixed position. The rotation of the rubber-covered rollers is controlled by varying the supply voltage when electromagnetic brakes or clutches are used,

or the number of revolutions in the case of electronically operated motor reducers, holding back the stretch film to a greater or lesser extent and thus regulating its stretch as it is being fed. The elastic return of the film assures the stability of its wrapping around the load.

The film is cut at the end of the wrapping cycle, either manually by the operator or with the help of automatic cutting means arranged downstream of the control rollers. In the latter case an initial laceration produced by the cutting means is made to evolve transversely into a complete cut by locking the control rollers and continuing the relative rotation movement between the assembly and the load. The terminal flap of film generated in this manner remains attached to the formed package.

When the film is torn, due to the effect of the elastic return of the material the flap upstream of the cut tends to return into the assembly, becoming disengaged from the conveyance rollers and obliging the operator to re-position it on these rollers before resuming operations with the next wrapping cycle. This circumstance is not only bothersome for the operator, but also causes substantial losses of time and therefore of the productivity of the packing operations.

Furthermore, when automatic cutting means are used, in the procedure described above, the evolution of the cut and its final position in relation to the length of film that has been pulled out of the assembly cannot be accurately controlled. Especially in critical circumstances of the angle at which the film leaves the assembly and the tension at which it does so, due to the substantial portion of film that freely extends downstream of the constraint point, there will be formed a tail of

film that, on completion of the cut, will dangle in irksome fashion from the packed goods.

Summary of the invention

The basic object of the present invention is to provide a stretch film unrolling and pre-stretching assembly that is provided with automatic film cutting means that will avoid the worker having to interfere with the assembly at the end of the cutting operation in order to re-position the film for the next wrapping cycle.

Furthermore, it is an object of the present invention to provide an assembly of the aforementioned type that will make it possible to obtain more accurate control of the final position of the cut, avoiding in particular the formation of tails of film on the packed goods or products.

The assembly for unrolling and pre-stretching stretch film in accordance with the present invention comprises control means for controlling the forward movement of the film that is being unrolled from a spool, and cutting means for lacerating said film, arranged downstream of said control means, the assembly being characterized in that, downstream of said cutting means, it comprises means for preventing the return of the film in the direction opposite to the one in which it leaves the assembly.

Preferably, these return preventing means comprise two rubber-covered rollers rotating in opposite directions and in contact with each other in such a way as to allow the film to pass between them, the rollers being provided with means to prevent their rotation in the direction opposite to the one that corresponds to the film leaving the assembly.

The method for cutting the film envisages the film first being brought to a halt by the control means and the simultaneous operation of the cutting means in order to produce a laceration of the material. According to the invention, rather than proceeding right away with the cutting of the film by letting the laceration degenerate, the control means are released in order to permit the laceration zone to pass downstream of the return preventing means. Only at this point is the film brought to a halt again and the cut completed. In this way, there is a point of constraint of the film immediately upstream of the cutting zone and, at the same time, at the outlet from the assembly, with better control of the final position of the cut.

Brief description of the drawings

The characteristics and advantages of the stretch film unrolling and pre-stretching assembly with improved system for automatically cutting the film and of the method for use therewith in accordance with the present invention will be brought out more clearly by the following description of a particular embodiment thereof, which is given purely by way of example and is not to be considered limitative in any way, said description making reference to the attached drawings, in which:

- figure 1 shows a schematic perspective view of the cutting device of the assembly in accordance with the present invention;

- figure 2 shows an exploded view of the cutting device of figure 1;

- figures 3a and 3b show the film cutting blade of the device in greater detail in, respectively, its cutting position and its rest position;

- figure 4 is another perspective view of a stretch film unrolling and pre-stretching assembly in accordance with the present invention, equipped with the device of the previous figures;

- figure 5 shows the assembly of figure 4 seen from a different angle and - for the sake of clarity - with its top casing removed; and

- figure 6 shows a plan view of the assembly illustrated by figures 4 and 5.

Description of a preferred embodiments

Referring to the above figures, and for the moment especially to figures 4 to 6, the stretch film unrolling and pre-stretching assembly in accordance with the invention is part of a packaging machine of a known typology that is neither shown here nor described in detail. The assembly itself has an overall structure based on prior art with which any person skilled in the art is familiar and which is not therefore described in detail. As far as the present invention is specifically concerned, it is sufficient to mention a frame 1, comprising a lower plate 1a and a top casing 1b at a certain distance from each other, with rubber-covered rollers 2 that extend between them to control the forward movement of the film. The rollers 2 are driven via a transmission 3 by a motor reducer 4, shown by broken lines in figure 6, accommodated within the casing 1b. Also to be noted in the figures are idle conveyance rollers 6 arranged downstream of the rubber-covered rollers 2, and a support 7 for a spool of film 8, delineated in figure 6, where there is also indicated the film path 8a, unwound from spool 8, across the control rollers 2 and the idle conveyance rollers 6 to the exit from the assembly.

According to the invention, and referring now also to figures 1 to 3, downstream of the conveyance rollers 6 and in the zone where the film leaves the unrolling and pre-stretching assembly, frame 1 supports a film cutting device, indicated as a whole at the reference number 9, that likewise extends between the lower plate 1a and the top casing 1b. Device 9, in its turn, comprises a frame 10 with a lower plate 10a and a top casing 10b, between which there extend two rubber-covered rollers 11 arranged in contact with each other in such a way as to engage with the film, letting it pass between them. The forward motion of the film leaving the assembly obviously causes the two small rollers to rotate in opposite directions, as indicated by the arrows F in figure 1.

The two rollers 11 are provided with a system that prevents them from rotating in the direction opposite to the one that corresponds to the film leaving the assembly. This effect can be obtained with any known system, for example, by mounting the small rollers on their respective fixed axes of rotation by means of drawn cup roller clutches, not shown in the figures. Upstream of rollers 11 and inside the top casing 10b of frame 10 there is housed a film cutting mechanism that can be seen, in particular, in figures 2, 3a and 3b and is indicated as a whole at the reference number 12. The mechanism 12 comprises a blade 14 supported by an arm 13 that is hinged in an intermediate position in such a way as to be able to undergo an angular displacement in a plane which crosses the plane in which the film lies as it leaves the assembly.

More precisely, blade 14 projects transversely from one end of arm 13, the lower end in the configuration of the illustrated example, in such a way as to partially

project outside casing 10b, passing through a slot 15 formed in the casing, so that it can lacerate the film following a rotation of arm 13 towards a cutting position (see figure 3a). On the other hand, the rotation of arm 13 in the opposite direction, towards a rest position (see figure 3b), causes blade 14 to return inside the case, leaving the film free to move forward, without interference, towards rollers 11.

The cutting mechanism also comprises actuator means to rotate arm 13. In the illustrated embodiment, these means comprise a pair of linear electromagnetic actuators 16 and 17 that act, respectively, on the upper end of arm 13, opposite the end that bears blade 14, and on a point intermediate between the blade and the hinge point of the arm. As can clearly be seen from figures 3a and 3b, the cutting position of arm 13 is determined by a backward configuration of the upper actuator 16 and a forward configuration of the lower actuator 17. On the other hand, the rest position corresponds to a forward configuration of the upper actuator 16 and a backward configuration of the lower actuator 17. Actuators 16 and 17 are controlled by the electronic control system of the machine, which system obviously also controls the operation of motor reducer 4 and therefore of rollers 2.

As already mentioned, the procedure for wrapping the film around the load to be wrapped with the assembly in accordance with the invention is carried out in a conventional manner due to the effect of the mutual rotation between the assembly and the item. During its normal feed, the film leaving the assembly passes between the two rubber-covered rollers 11 rotating in opposite directions, arm 13 being kept in its rest position. When

the cycle of wrapping the load approaches its end, control rollers 2 are locked for a certain time that may vary according to the circumstances, thus bringing the forward movement of the film to a halt. At the same time, arm 13 is brought into its cutting position, so that blade 14 causes a perforation of the film, after which it is immediately brought back into its rest position.

According to the invention, control rollers 2 are then unlocked to make the film move forward, thus permitting the perforation zone to get out downstream of rollers 11. At this point, once more after an interval of time that may be arbitrarily determined, rollers 2 are again locked, thereby bringing the film to a new halt. Since the relative movement between the assembly and the load to be wrapped continues, the film downstream of the point at which it is constrained becomes greatly stretched. The perforation will thus rapidly degenerate into a complete transverse cut. The wrapping cycle may terminate, with rollers 11 that, not being able rotate in the direction opposite the one in which the film leaves the assembly, prevent the flap of film from shrinking into the interior of the assembly due to the elastic return effect following the cut. The flap is therefore securely and readily accessible for the operator to commence the next cycle.

Apart from this aspect, which clearly resolves in a fully satisfactory manner the problematics explained in the introductory part, the assembly and the cutting procedure realized in accordance with the invention obtain the important result of an effective control of the evolution of the cut, this in contrast with what happens in the prior art. In fact, rollers 11 provide an

additional point of constraint of the film in the outlet zone, preventing the cut from assuming an unforeseeable position and, more particularly, giving rise to a long tail of film dangling from the wrapped products/goods. Nor should one overlook the safety of the cutting system for the purposes of accident prevention, since rollers 11 prevent access being gained from the outside to the zone in which blade 14 operates. Lastly, the whole device 9, being a single body distinct from the rest of the assembly, can be easily removed therefrom whenever it has to be checked and/or maintained.

As already noted, the assembly in accordance with the invention can be used in any semi-automatic machine for wrapping pallets or various products. The assembly itself, apart from the improved system according to the invention, may have overall characteristics different from those of the illustrated embodiment. In particular, the control rollers 2 with the associated motor reducer 4 could be replaced by alternative control means in accordance with what is already known to prior art. Constructional solutions different from the one here shown by way of example could also be used for operating the blade (for example, pneumatic or purely mechanical systems), though the shown solution is advantageous on account of its structural and functional simplicity. In particular, the double movement of arm 13 by means of the two actuators 16 and 17 assures a precise, safe, and reliable movement.

Other variants and/or modifications can be brought to the stretch film unrolling and pre-stretching assembly with improved system for automatically cutting the film and to the cutting procedure for use therewith in

accordance with the present invention without thereby departing from the scope of the invention itself.